

# CONTROLS IN WORK SITUATIONS REVEALED BY ORGANISATIONAL SLIP, TRIP AND FALL ACCIDENT (STFA) FACTORS. CONSEQUENCES FOR PREVENTION

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Workplace design and upkeep or human factors are frequently advanced for explaining Occupational Slip, Trip and Fall Accidents (OSTFAs). Despite scientific progress, these accidents are also commonly considered to be “simple” accidents. To encourage an evolution in these perceptions, this document sets out to orient our vision towards organisational factors, which often combine with other accident factors to cause movement disturbance and injury in work situations. These factors are frequently the outcome of arbitration between production and safety, which implies implementation of controls by employees; controls that can lead to greater employee exposure to STFA risk. We propose a model focusing on these controls, in particular to account for the need to confront production and safety logics within the company and to enhance the potential for appropriate prevention action.

## Introduction

The literature often advances workplace design and upkeep (Bell et al., 2008; Amandus et al., 2012), access system configuration (Leamon & Murphy, 1995) or, again, human factors (Davis, 1983; Gauchard et al., 2001) for explaining OSTFAs. Neutralisation of these factors, with the intention of securing displacements, is a first step towards preventing such accidents. However, these prevention actions frequently overlook production requirements and this is why they can only offer a partial response to preventing all OSTFAs. Research into these accidents effectively shows that, as in all occupational accidents, many configurations of accident-causing events stem from arbitration between production and safety, which cannot be ignored if progress is to be achieved in the prevention field. These arbitrations lead to controls applied under working conditions to perform the activity, while conserving safety. Many of these controls are reflected in employee’s movements, which are performed when performing the task. One of the most frequent involves walking fast to try to catch up a delay or confront an emergency. These observations provide a partial explanation for operator difficulties in systematically applying certain recommendations aimed at preventing OSTFAs; recommendations nevertheless based on common sense, such as “Don’t rush!”

This paper firstly introduces both the need and the limits for neutralising the accident factors closest to the injury in OSTFA genesis. It then describes arbitrations between production and safety prompted by so-called “organisational”<sup>1</sup> STFA factors referred to in the literature.

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<sup>1</sup> The notion of organisation is vast and the purpose here is to describe neither the features nor different standpoints, from which it is considered (cf. Monteau, 2010 on this subject). The organisational factors referred to in this document are those, which refer to the organisation activity undertaken by the company.

Some of these arbitrations imply implementation of controls by the employee performing the task, reflected in his/her displacements or, more generally, in his/her movements, which increase his/her exposure to STFA risk.

### **Neutralising factors closest to the injury in OSTFA genesis: need and limits**

In some work situations, movement disturbance factors (floor in poor condition, difficult access to certain work areas, etc.) may exist permanently and visibly, and may expose many employees over quite long periods. For example, this is the case of slippery floors in food processing shops. These factors, along with "haste" or "carelessness", are frequently advanced for explaining STFA occurrence.

Their neutralisation often involves acting on certain working conditions (installing a slip-resistant floor, reconfiguring an access system, etc.) or on behaviours (e.g. instructions to employees to be attentive to performing their displacements or to adopting a "safe", unhurried displacement, which avoids short-cuts). However, neutralisation of movement disturbance factors is frequently accompanied by ignorance of other aspects, which are sometimes more difficult to objectify and control, such as the urgency of the situation, fatigue or certain activity requirements. Yet, as in all OAs, it is often a combination of factors of different type that will cause the OSTFA. For example, a clearly visible obstruction will not be taken into account by an employee whose visual attention is absorbed by his/her task during a displacement.

On the other hand, a STFA can occur without the involvement of a permanent, visible anomaly in the environment: an employee, late for his/her appointment, misses a step when running up stairs, which are not subject to any design anomaly. Finally, many situations are temporarily more favourable to STFA occurrence: when performing his/her activity, an employee collides with an element in his/her environment, which obstructs his/her movement; the employee had intended to move this element once priority work was completed.

Hence, while it is important to neutralise accident factors, which are permanent and visible in the work environment, it is just as important to analyse the part played by this factor in a more comprehensive accident genesis. We also need to understand the behaviours adopted in work situations; behaviours often reflecting the presence of organisational factors.

### **Organisational STFA factors and underlying controls**

The literature includes accounts of in-depth analyses of slips, trips and other movement disturbances conducted at various companies. The events leading to injury are therefore embedded in the operation of the relevant company. Some events are related to arbitrations between production and safety, to which reference was made long ago in the general occupational accident field. For example, situations described under the terms of recovery or momentary co-activity by Faverge (1970) reflect such arbitrations revealed when analysing accidents in iron mines, in particular. When analysing occupational health and safety from an organisational perspective, Monteau (2010) refers to the "known organisational risks"; one is bound to note that few of these accidentology studies are put to advantage in relation to understanding and preventing OSTFAs. Yet, the contribution of multiple organisational factors has been revealed, when analysing these accidents.

Research reported in Bentley & Haslam (1998) and in Leclercq & Thouy (2004) questions the role of **work preparation** in STFA occurrence. Bentley & Haslam (1998) effectively describe the difficulties encountered in distributing mail in time during periods when there is snow and ice. Leclercq & Thouy (2004), for their part, demonstrate that several accidents involved field operators climbing up into and down from their trucks, when checking equipment required for various building sites during the day. This phase of their activity demanded all the more attention since instances of missing equipment were frequent.

Furthermore, the Leclercq et al. (2007) study specifically addressing STFAs sustained by train drivers revealed in particular **problems of task allocation or attribution** as well as

**recovery situations**, i.e. situations in which “the normal task is interrupted by an incident and one has to recover, in other words strive to restore the usual course of work” (Faverge, 1970). Three train drivers effectively sustained an STFA involving scenarios with similar characteristics. These accidents occurred when inspecting the train prior to its departure. In the first case, the train started to brake during the operation. In the second case, the inexperienced driver detected a brake failure he had never before encountered and did not know how to solve and, in the third case, the driver climbed down again from the train after forgetting an inspection point. In every case, the driver gave his full attention to the inspection to prevent the train being delayed and, when walking, tripped on a sleeper or a plate creating an irregularity on the ground. In the first two cases, the driver was implementing a recovery activity at the time of the accident to make the train braking system operational. Any recovery situation introduces or accentuates a time constraint, so the resources mobilised to make the braking system operational as quickly as possible were partially lacking in terms of controlling displacement and effectively caused the driver to trip.

Bentley et al. (2005) refer to a “**concurrent visual task**” for explaining the occurrence of certain OSTFAs; they also emphasise that, at a given moment, the resources dedicated to performing the task may be lacking in terms of controlling displacement.

Moreover, in many cases the presence of obstructions to displacement results from earlier or simultaneous work performed by employees other than the one who sustains an STFA, thereby revealing the part played by **co-activity or a succession of activities** in the occurrence of these accidents. For example, an employee has to modify his/her itinerary in reaction to tools present on his/her route; tools that are useful to workmen installing new equipment. The change in itinerary may be considered a recovery activity, which is in fact intended to restore the usual course of work by returning to the planned itinerary. Co-activity, which was historically described by Cuny (CECA, 1969), corresponds to task performance by persons pursuing different production objectives and required to simultaneously share the same workplace. Interim situations or those involving subcontracted work, in particular, can generate co-activity or a succession of activities.

Finally, Bentley & Haslam (1998) showed that the “**job and finish**” policy implemented at the time in the United Kingdom’s mail distribution company, which allowed employees to go home as soon as the last mail had been distributed, could encourage employees to take risks by hurrying or taking short-cuts. These authors reported that the employees explained that the accident risk when reading mail addresses while walking was more acceptable than the time wasted in stopping to read the addresses.

## Consequences for prevention

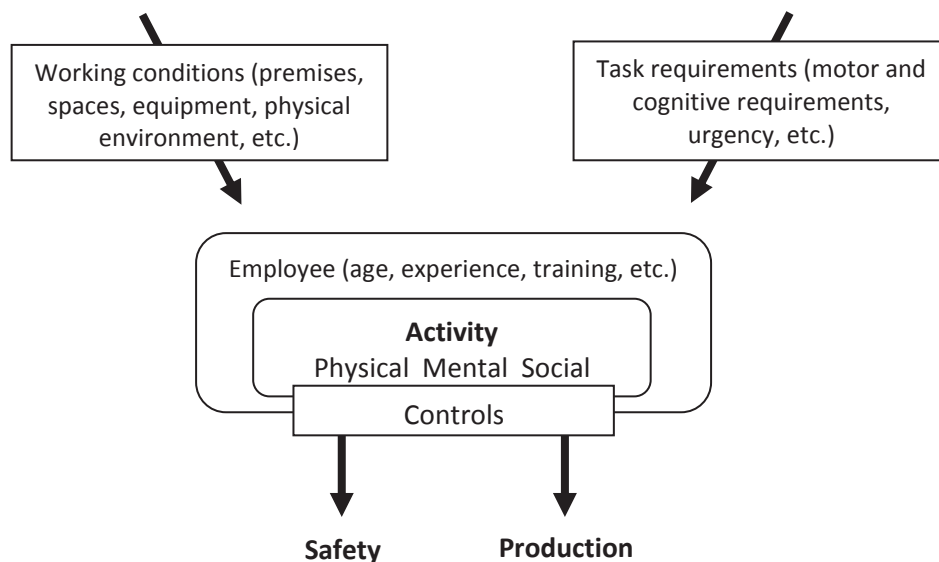
Working conditions (hence movement performance conditions) play a part in STFA occurrence since they make it more or less difficult to control displacement and movement.

The organisational factors highlighted, when analysing OSTFAs, reveal employee arbitration between production and safety in the work situation, in which he/she is exposed to STFA risk. These arbitrations relate in particular to the organisation activity implemented by the company. Neutralisation of organisational factors therefore requires local and collective management of the STFA risk to ensure both proximity to the company’s specific characteristics and to confront existing logics and viewpoints. Bentley & Haslam (1998) effectively state that, depending on the employees distributing the mail, managers consider performance a priority over safety and that the employees themselves prefer rapid performance to safer performance of the work; their attitudes reflecting those of the management.

As in the face of all OA risks, controls are implemented to perform the task, while ensuring safety with regard to the STFA risk, in other words while ensuring movement control. Yet, this risk may a priori manifest itself during any work-related movement. These are as much “job-related gestures” (collision when screwing because the spanner slipped) as more atypical movements, such as picking up an object or displacing. Controls implemented in work situations are thus virtually permanent and the employee manages the available resources in

order to perform his/her task, while controlling his/her movement. The resources required for movement control vary in time and with respect to the work situation. For example, Derosier et al. (2008) report situations, in which metallurgists are sometimes required to displace themselves over template elements similar to beams. Moreover, the resources needed to perform the task as a whole are also variable. Thus, the task characteristics and requirements will condition the resources dedicated to movement control.

Some controls implemented in work situations, which have an impact on movement control, can be easily observed (rushing, moving round obstructions, etc.). On the other hand, revealing some of these controls requires a very fine observation grid (distance allocated as safety margin between foot and low-level obstruction during a displacement, supports used, etc.). Figure 1 illustrates a model of work situation understanding based on the person and his/her activity adapted from the model developed by Vézina (2001) in relation to musculoskeletal disorders (MSDs). MSDs and OSTFAs are all outcomes of occupational risks involving movements at work (Leclercq et al., 2013), so OSTFA prevention, which has been the subject of little research to date, can take advantage of studies in the MSD prevention field. Transposition of this model is a clear illustration of this.



**Figure 1. Model of OSTFA understanding based on the employee and his/her activity (adapted from model developed by Vezina (2001) in relation to musculoskeletal disorders)**

## Conclusion

Despite scientific advances in safety, OSTFAs remain commonly considered as “simple” accidents resulting from a malfunction in a “simple” system, which might suggest that their prevention is “simple”... To encourage an evolution in these perceptions, this document sets out to orient our vision towards organisational factors, which often combine with other accident factors to cause movement disturbance and injury in work situations. Whilst manifesting themselves in an individual's movement in a work situation, these manifestations are none the less an unwanted consequence of productive organisations. STFA organisational factors reveal the need for local and collective management of this risk and the importance of a better understanding of movement/displacement performed in work situations, i.e. in a context integrating in particular task requirements and working conditions.

While the organisation activity implemented by the company represents a lever for STFA prevention, two points should be noted: on the one hand, this organisation activity is itself constrained and, on the other hand, this lever is not unique. Maximum possible neutralisation of

factors close to the injury in the accident genesis and risk awareness also represent major lines of prevention. Awareness of the OSTFA risk, in particular, is an essential prerequisite to any progress in preventing these accidents. Perception of the OSTFA risk and its more or less “accepted” nature are factors, which determine both consideration of this risk at every level of the company and controls implemented by the operator in work situations.

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